

TBD07 – IB HL Review Questions #1

1. (a) enzyme lowers activation energy;
Award [1] for how the activation energy is lowered e.g.
 enzyme binds to substrate/ $E + S \rightleftharpoons ES$ then enzyme-substrate complex
 breaks up to give product and enzyme/ $ES \rightarrow P + E$; 2
- (b) (i) graph linear at low concentrations so rate increases as $[S]$
 increases/OWTTE;
 because of more frequent E-S interactions/collisions;
 graph flattens out at higher concentrations so rate unaffected
 by $[S]$ /OWTTE;
 because active sites on enzyme become occupied; 4
- (ii) $V_{\max} : 630 \times 10^{-6} / 6.30 \times 10^{-4}$ (ignore units);
 $K_m : 12 - 13 \times 10^{-3}$ (ignore units); 2
 (penalize once only if $\times 10^{-x}$ is missing)
2. (a) enzyme has an active site that substrates bind to;
 substrate reacts (to form products);
 products leave active site;
 provides an alternative pathway with a lower activation energy;
 explanation of lock and key hypothesis/induced fit hypothesis; 3
- (b) rate increases at first/up to maximum;
 more reactant molecules have energy greater than E_a /more frequent collisions;
 rate decreases after maximum/optimum temperature;
 enzyme becomes denatured/3-D/tertiary structure breaks down/
 quaternary structure
 changes/active site affected; 4
3. (a) (i) the nucleotides condense/form a phosphodiester bond;
 between the C_3 of the sugar and a neighbouring phosphate group; 2
- (ii) hydrogen bonds formed between the different strands;
 thymine/T bonds to adenine/A and cytosine/C bonds to guanine/G; 2
- (b) the coded information lies in the sequence of triplets of bases/codons;
 each codon/triplet represents an amino acid (or a terminator); 2
- (c) *Award [1] for any three of following.*
 DNA extracted from blood/sample;
 cut into mini-satellites using restriction enzymes;
 fragments separated by gel electrophoresis
 some mention of method of detecting the pattern e.g. labelling with ^{32}P and
 using X-ray film/staining with fluorescent dye;
 DNA profile taken from child should be similar to adult's
 DNA if the adult is the parent; 4 max
The last point stands in its own right.
4. (a) protein;
 catalyst; 2
- (b) rate increases (at first/up to about $40^\circ C$) because more substrate/
 reactant molecules have activation energy;
 more successful collisions/interactions (between enzyme and substrate);
 peak of graph represents optimum activity/fastest reaction;
 rate decreases above about $40^\circ C$ because tertiary/quaternary structure changes/
 enzyme denatured;
 active site affected; 4 max
Award [1] each for any four.

[8]

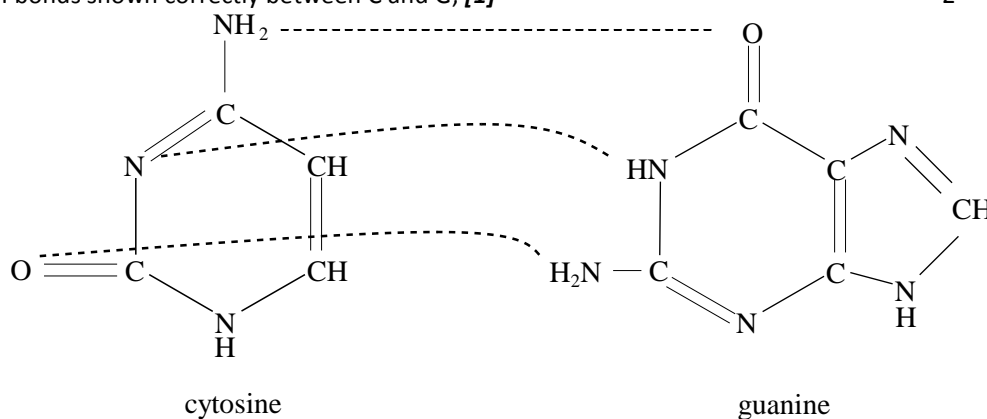
[7]

[10]

[6]

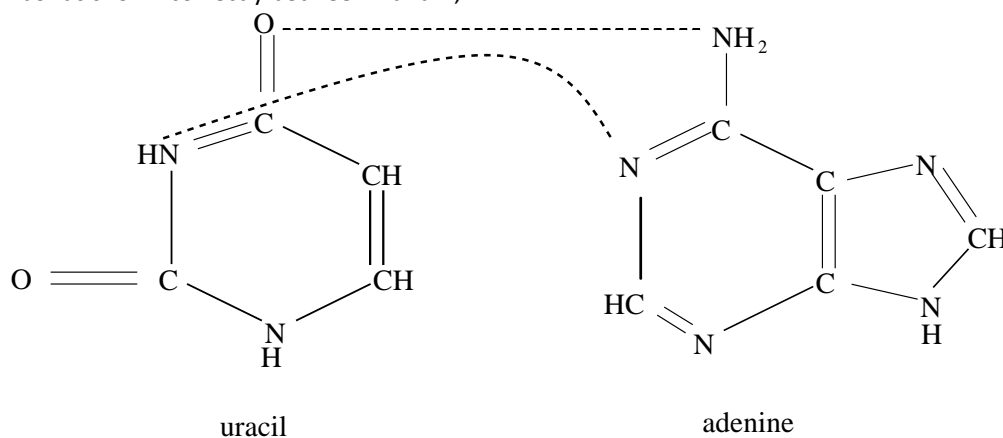
5. (a) 3 H bonds shown correctly between C and G; [2]
2 H bonds shown correctly between C and G; [1]

2



- (b) uracil (pairs with adenine);
2 H bonds shown correctly between U and A;
OR
2 H bonds shown correctly between T and A;

2

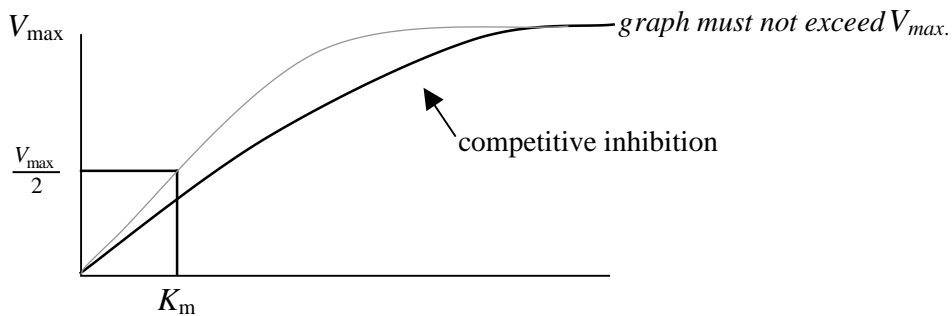


6. (a) reaction slows down;
 V_{\max} unchanged;
 K_m increased;
inhibitors occupy active sites;
substrate molecules prevented from binding to enzyme;
Any four for [1] each.

4

- (b) position of K_m must show derivation (using $\frac{1}{2} V_{\max}$).
correct line must show slower rate but need not extend to V_{\max} .

2



[6]

7. glucose is converted to pyruvate;
 which in the presence of oxygen changes to carbon dioxide and water;
 glucose undergoes oxidation;
 oxygen undergoes reduction;

4

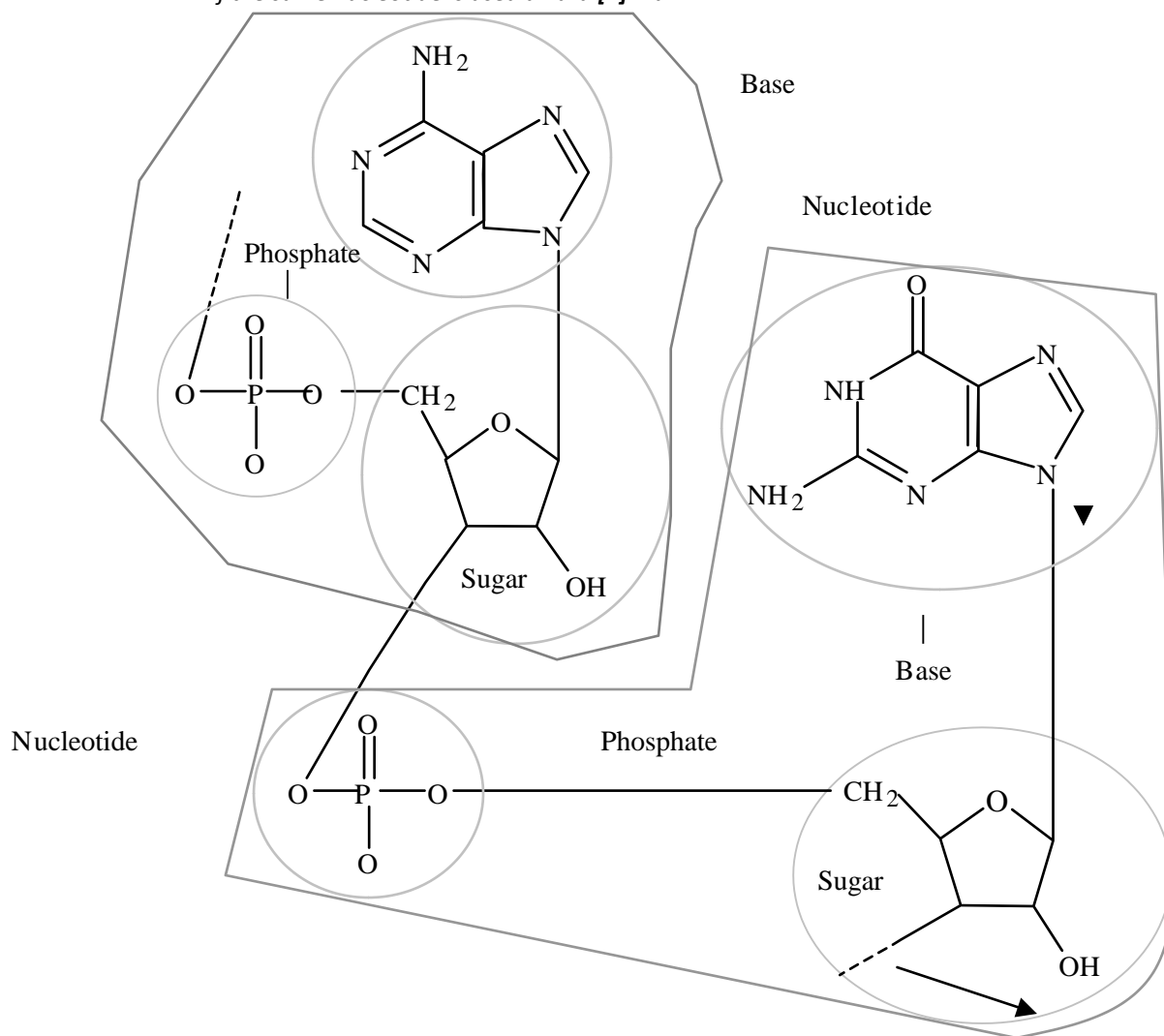
[4]

8. (a) Ringing and labelling one of the two nucleotides;
 (b) for the other nucleotide:
 circling and labelling base;
 circling and labelling sugar/pentose/ribose (*accept deoxyribose*);
 circling and labelling either phosphate;

1

3

If the same nucleotide is used award [2] max.



[4]